REMARKS/ARGUMENTS

Claims 1 – 12, 14, 15, and 17 are in the application. Reconsideration is respectfully requested.

Claim Rejections 35 USC § 102

Claims 1 and 7 have been rejected as anticipated by the disclosure of Dogan et al, US Patent Number 6,018,317. After considering the Examiner's comments made in paragraph 3 of the office action, applicant respectfully traverses this rejection in light of the following remarks.

Dogan does not disclose the steps of: identifying uplink nulls and an uplink main beam position from said uplink beamforming weight vector, transforming each of said uplink nulls to form a corresponding downlink null, and generating a downlink beamforming weight vector from all downlink nulls.

The office action selectively identifies sections in the description of Dogan in order to support the anticipation rejection. However, the Examiner has failed to appreciate the overall teachings of that document as a whole.

Specifically, while it is an object of any co-channel communication system to ensure that users receive the desired signals and interference from undesired signals is reduced or eliminated, it is not this advantageous result which is the kernel of the present invention. Instead, it is the route which is taken to obtain the advantageous result which forms the novel and inventive concept of the invention.

Prior art systems generally first estimate each user's direction of arrival from the received uplink signals, and then construct the downlink channel responses using downlink steering vectors for the estimated directions of arrival. Finally, the downlink channel responses are set as the downlink beamforming vectors. This process is extremely complicated, computationally expensive, and does not provide enough downlink capacity to match its uplink counterpart. These problems are discussed on page 13 of the application as filed as well as in the discussion of the prior art in the application as filed.

The system disclosed in Dogan clearly falls within the category of prior art mentioned in the previous paragraph. In particular, we make reference to one of the sections cited by the

Examiner in the office action, notably column 63, line 63 to column 64, line 3. This section states that when transmitting signals between two rays of antennae it is possible to use a generalized steering vector obtained by "CURE" from the received signal for signal transmission from one of the rays. This results in, unsurprisingly, a directivity pattern in which the lobes and nulls of the transmitted signal will be placed at the same angles as those of the received signal. The Examiner has failed to appreciate the differences between this method and the present invention as defined in claims 1 and 7, in particular, the complexity of this method when compared with the simplicity of the present invention.

The term "CURE" refers to cumulant recovery algorithms. A large number of different possible algorithms are discussed in Dogan throughout the description. All of these processes are computationally expensive and result in the output of a generalized steering vector of the received signal. The Dogan document discloses various different implementations of the "CURE" system including, for example, iterative methods. The simplest form of the "CURE" system is referred to as "CiCURE." The system is described in columns 38 – 40 of Dogan, but is not repeated here for brevity.

Clearly, although the results of both the present invention and the system of Dogan will be very similar, the methods by which those results are obtained are entirely distinct. The present invention simplifies the entire process by utilizing estimated uplink beamforming weight vectors for each terminal from the combinations of arriving uplink signals, identifying uplink nulls and uplink main beam position from the uplink beamforming weight vector, transforming each of the uplink nulls into a corresponding downlink null, generating a downlink beamforming weight vector from all of the downlink nulls and transmitting information based on the downlink beamforming weights.

Since no prior art reference of record discloses this simplified process. Applicant submits that the present invention (as defined by claims 1 and 7) is not anticipated. Moreover, since the entire prior art teaches away from the simplified method recited by claims 1 and 7 of the present application, those claims are not rendered obvious thereby.

Claim 18 has been cancelled, thus obviating the associated rejection of that claim.

Claim Rejections 35 USC § 103

The Examiner has raised obviousness rejections against claims 2 and 6. Applicant submits, however, that these two dependent claims are now allowable in combination with their allowable base claim 1.

Similarly, claims 3 to 5 and 8 to 10 are also allowable in combination with their allowable base claims.

As respects independent claim 11, the obviousness rejection relies on the combination of Dogan and Dent and Bakhru. The stated grounds, however, appear to disregard a particular type of "bad nulls" to which claim 11 relates. In particular, claim 11 refers to "pseudo nulls" which are created when converting uplink weights into downlink weights via the null constraint method. None of the documents cited by the examiner discloses the null constraint method and, therefore, none of the documents cited by the examiner appreciates the problems associated with the null constraint method.

In order to emphasize the use of the null constraint method, claim 11 has been amended so that the pertinent step of that claim now reads: "generating a downlink beamforming weight based on the signal's uplink beamforming weight *using the null constraint method."* The novel features of claim 11 are, therefore, the use of the null constraint method and the step of constraining the system to those terminals in a sector in which no pseudo nulls would be generated. These steps are not taught by any of the prior art documents. Neither do the prior art documents consider the problem of pseudo nulls. Therefore, the present invention as defined by amended claim 11 is patentable over the prior art or record.

Claim 12 has been rejected as obvious in view of the combination of Dogan and Boros. In reply, applicant notes that claim 12 contains the features of claim 1 and, therefore, the argumentation presented above in relation to claim 1 also applies to this claim.

In relation to claim 14 – against which the Examiner has raised an obviousness rejection– that claim has been amended to specify that the downlink weight generator operable to generate downlink weights based on a signals uplink beamforming weight uses the null constraint method. The argumentation presented above in relation to the pseudo nulls and null

constraint method (claim 11) also apply equally to this claim 14 and, therefore, claim 14 is believed to be patentable over the art of record.

Dependent claims 15 and 17 are allowable in combination with their allowable base claims.

Conclusion

In view of the foregoing, applicant believes that all of the currently pending claims are in condition for allowance, and an early notification to that effect is respectfully requested. If the Examiner has any questions, he is invited to contact applicant's attorney at the below-listed telephone number.

Respectfully submitted,
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